

CBSE 12th Physics 2007 Unsolved Paper Outside Delhi

TIME - 3HR. | QUESTIONS - 30

THE MARKS ARE MENTIONED ON EACH QUESTION

SECTION – A

Q.1. Give the logic symbol of NOR gate. *1 marks*

Q.2. State the reason, why GaAs is most commonly used in making of a solar cell. *1 marks*

Q.3. What is geometrical shape of equipotential surfaces due to a single isolated charge? *1 mark*

Q.4. What are the direction of electric and magnetic field vectors relative to each other and relative to the direction of propagation of electromagnetic waves? *1 mark*

Q.5. Define Capacitive reactance, Write its S.I. Units. *1 mark*

Q.6. You are given following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope? *1 mark*

Lenses	Power (p)	Aperture (A)
L1	3D	8cm
L2	6D	1cm
L3	10D	1cm

Q.7. A plane electromagnetic wave travels in vacuum along z-direction. What can you say about the direction of electric and magnetic field vectors? *1 mark*

Q. 8. Define the term 'Mobility' of charge carriers in a conductor. Write its S.I. unit. *1 mark*

SECTION - B

Q.9. Distinguish Between 'intrinsic' and 'extrinsic' semiconductors. *2 marks*

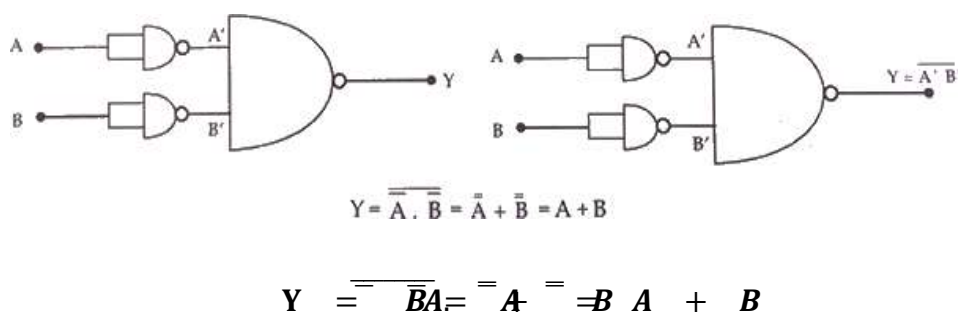
Q.10. A test charge 'q' is moved without acceleration from A to C along the path from A to B and then from B to C in electric field E as shown in the figure. (i) Calculate the potential difference between A and C. (ii) At which point (of the two) is the potential more and why? *2 marks*

Q.11. Two metallic wires of the same material have the same length but cross-sectional area is in the ratio 1:2 they are connected (i) in parallel. Compare the velocities of electrons in the two wires in both the cases (i) and (ii). *2 marks*

Q.12. Answer the following questions: *2marks*

- Optical and radio telescopes are built on the ground while X-ray astronomy is possible only from orbiting the earth. why?
- The small ozone layer on top of the stratosphere is crucial for human survival. Why?

Q.13. In the circuit shown in the figure, identify the equivalent gate of the circuit and make its truth table. *2 mark*



Q.14. Considering the case of a parallel plate capacitor being charged, show how one is required to generalize Ampere's circuital law to include the term due to displacement current. *2 marks*

Q.15. In the meter bridge experiment, balance point was observed at J with $AJ = l$. *2 mark*

- The values of R and X were doubled and then interchanged. What would be the new position of balance point?
- If the galvanometer and battery are interchanged at the balance position, how will the balance point get affected? *2 marks*

Q.16. Using Ampere's circuital law, obtain the expression for the magnetic field due to a long solenoid at a point inside the solenoid on its axis. *2 marks*

Q. 17. In the study of Geiger-Marsdon experiment on scattering of α particles by a thin foil of gold, draw the trajectory of α - particles in the coulomb field of target nucleus. Explain briefly now one gets the information on the size of the nucleus from this study. *2 mark*

From the relation $R = R_0 A^{1/3}$, where R_0 is constant and A is the mass number of the nucleus, show that nuclear matter density is independent of A .

Q. 18. Draw a labelled ray diagram showing the formation of a final image by a compound microscope at least distance of distinct vision. *2 mark*

SECTION – C

Q. 19. A 12.5 eV electron beam is used to bombard gaseous hydrogen at room temperature. Unto which energy level the hydrogen atoms would be excited? Calculate the wavelengths of the first member of Lyman and first member of Ballmer series.

3 marks

Q.20. Draw a labelled ray diagram of a refracting telescope. Define its magnifying power write the expression for it.

Write two important limitations of a refracting telescope over reflecting type telescope. *3 marks*

Q.21. (a) An electric dipole of dipole moment \vec{p} consists of point charges $+q$ and $-q$ separated by a distance $2a$ apart. Deduce the expression for the electric field \vec{E} due to the dipole at a distance x from the center of the dipole on its axial line in terms of the dipole moment \vec{p} . Hence show that in the limit $x \gg a$, $E \rightarrow \frac{2p}{4\pi\epsilon_0 x^3}$. *3 marks*

Q.22. With the help of a diagram, explain the principle and working of a moving coil galvanometer. *3 marks*

Q.23. A light bulb is rated 100 W for 220 V ac supply of 50 Hz. Calculate

(i) the resistance of the bulb;

(ii) the *rms* current through the blub. *3 marks*

Q.24. (a) Define self-inductance. Write its S. I. units.

(b) Derive an expression for self-inductance of a long solenoid of length l , cross-sectional area A having N number of turns. *3 marks*

Q. 25. (a) In what way is diffraction from each slit related to the interference pattern in a double slit experiment?

(b) Two wavelength of sodium light 590 nm and 596 nm are used, in turn, to study the diffraction taking place at a single slit of aperture $2 \times 10^{-4} m$. The distance between the slit and the screen is 1.5.m. Calculate the separation between the positions of the first maxima of the diffraction pattern obtained in the two cases. *3marks*

Q.26. (a) Using de Broglie's hypothesis, explain with the help of a suitable diagram, Bohr's second postulate of quantization of energy levels in a hydrogen atom.

(b) The ground state energy of hydrogen atom is - 13.6 eV. What are the kinetic and potential energies of the electron in this state? *3 marks*

Q.27. An electron microscope uses electron accelerated by a voltage of 50 k. V. Determine the de-Broglie wavelength associated with the electrons. Taking other factors, such as numerical aperture etc. to be same, how does the resolving power of an electron microscope compare with that of an optical microscope which used yellow light? *3 marks*

SECTION - D

Q.28. (a) Define electric dipole moment. Is it a scalar or a vector? derive the expression for the electric field of a dipole at a point on the equatorial plane of the dipole. 5 marks

(b) Draw the equipotential surfaces due to an electric dipole. Locate the points where the potential due to the dipole is zero.

OR

Using Gauss' law deduce the expression for the electric field due to a uniformly charged spherical conducting shell of radius R at a point (i) outside and (ii) inside the shell.

Plot a graph showing variation of electric field as a function of $r > R$ and $r < R$. (r being the distance from the center of the shell)

Q.29. State Biot-Savart law, giving the mathematical expression for it. 5 mark

Use this law to derive the expression for the magnetic field due to a circular coil carrying current at a point along its axis. How does a circular loop carrying current behave as a magnet? 5 marks

OR

With the help of a labelled diagram, state the underlying principle of a cyclotron. Explain clearly how it works to accelerate the charged particles. Show that cyclotron frequency is independent of energy of the particle. Is there an upper limit on the energy acquired by the particle? Give reason.

Q.30. (a) Describe a simple experiment (or activity) to show that the polarity of emf induced in a coil is always such that it tends to produce a current which opposes the change of magnetic flux that produces it. 5 marks

(b) The current flowing through an inductor of self inductance L is continuously increasing. Plot a graph showing the variation of

(i) Magnetic flux versus the current

(ii) Induced emf versus dl/dt

(iii) Magnetic potential energy stored versus the current.

OR

(a) Draw a schematic sketch of an ac generator describing its basic elements. State briefly its working principle. Show a plot of variation

(i) Magnetic flux and (ii) Alternating emf versus time generated by a loop of wire rotating in a magnetic field.

(b) Why is choke coil needed in the use of fluorescent tubes with ac mains?